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CONSERVATION

OF

PENNSYLVANIA'S SOIL AND WATER

THROUGH

Soil Conservation Districts

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF AGRICULTURE

STATE SOIL CONSERVATION COMMISSION

HARRISBURG

1954

Soil Conservation is most beneficial when all the people living on a small watershed cooperate.

Yarnell Brook Watershed
a conservation area-
of the - - -
Gowanesque River Watershed Association-
Tio Count Soil Conservation District

Conservation of Pennsylvania's Soil and Water Through Soil Conservation Districts

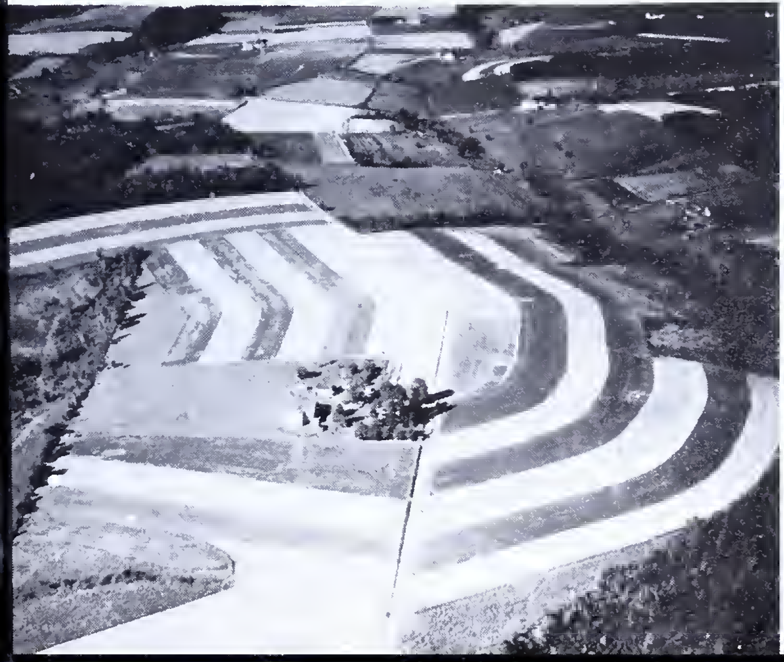
THE Pennsylvania "Soil Conservation Law" of one-thousand nine hundred forty-five, Act 217, created the State Soil Conservation Commission within the Department of Agriculture at Harrisburg. The Act charged the Commission with the responsibility of assisting the County Soil Conservation Districts in the Commonwealth working through the board of directors of the district.

This Act made it possible for counties to organize as County Soil Conservation Districts to conserve their soil and water resources. A Soil Conservation District is governed by a board of five directors, one is a member of the Board of County Commissioners, four are farmers nominated by county-wide agricultural organizations and appointed by the County Commissioners.

PENNSYLVANIA STATE SOIL CONSERVATION COMMISSION

W. S. HAGAR, Chairman

SAMUEL S. LEWIS
LYMAN E. JACKSON
E. M. SHAULIS
FRANK GORHAM



The Function of Soil Conservation District Directors

BOARDS OF DIRECTORS of County Soil Conservation Districts meet regularly. They receive farmers' requests for assistance in the field of conservation. They obtain the services of the cooperating agencies who can assist farmers solve their conservation problems.

The agencies now under agreement to cooperate with districts when requested are: Soil Conservation Service of the United States Department of Agriculture, The Pennsylvania Department of Forests and Waters, The Pennsylvania Game Commission, The Pennsylvania Fish Commission and the Pennsylvania Department of Highways.

The county soil conservation district assists farmers to develop and carry out a conservation farm plan on their farms. Cooperation with the district is entirely voluntary. When a farmer requests assistance from the district, the directors make technicians available from the cooperating agencies as desired and needed.

If you farm in a Soil Conservation district and you want help on some of your conservation problems, you should talk with one of your district directors. He will start you on the way to a soil conservation plan for your farm. The steps are as follows:

How to Get a Plan for Your Farm

1. Make application to the district directors for the help that the district can give you.

2. After the district directors have approved your application, they will arrange for a conservationist to come to see you.

3. If the conservationist does not already have a detailed soil survey of your farm, he will examine the land to determine the best use for every acre, whether for cultivated crops, hay, pasture or woods. The map he makes shows what kind of soils you have and how much protection they need from erosion.

4. The conservationist may ask you to meet with a group of your neighbors who are also preparing farm plans. He will discuss the land capabilities shown on the soils map and, together, you will discuss the general principles of farm planning.

5. At this point you and the conservationist should go over the farm, field by field. You should discuss with him the kind of land you have in each field or part of a field. Then, considering what crops you want to grow and what livestock you want to provide feed for, you should decide how you will use the land. The conservationist will suggest practices that will help make this use safe and productive.

6. After you have made these decisions about how you will use the land and protect it, you are ready to plan when and how to put the needed conservation practices on the land. You decide what kind of grass and legumes to plant and how to fertilize them. You figure out the best time to make any needed changes in field boundaries. You plan for any construction work that is needed to provide safe waterways, drainage, or better field layouts. You figure what it will cost and what you will get out of it. The conservationist can give you many good suggestions, but you must make the final decisions on what you want to do and when you will do it.

7. After you and the conservationist have decided on details of the plan, he will write them down as a record of the planning you have done together.

8. When you are ready to install any part of the plan that requires special help, you can notify the district directors or the technician who helped plan that practice. He will arrange for help in laying out the work on the land.

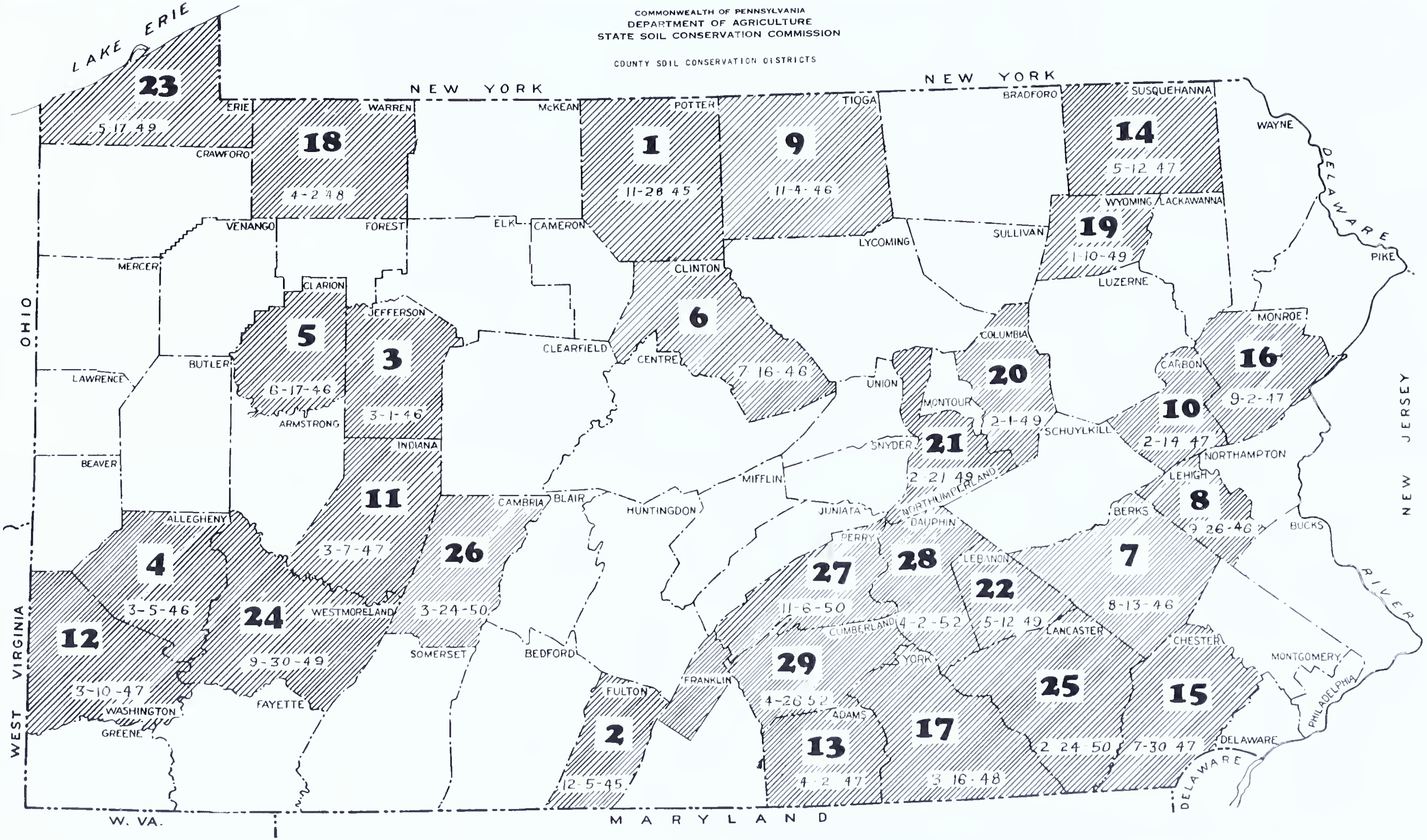
9. Some districts, but not all, give help in arranging for equipment for construction work and help get planting stock or other materials which you cannot obtain locally.

10. Some conservation measures are easier to install and more effective if neighbors work together. This cooperation may include sharing the cost of a ditch that drains part of several farms. Or it may be merely planning enough conservation work at one time in a neighborhood to make it worthwhile for a contractor to bring in heavy equipment.

More than 18,000 farmers in thirty Pennsylvania soil conservation districts thus far have taken advantage of the kind of help available in the district. Their farms include more than 2,280,000 acres that benefit from soil conservation.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF AGRICULTURE
STATE SOIL CONSERVATION COMMISSION

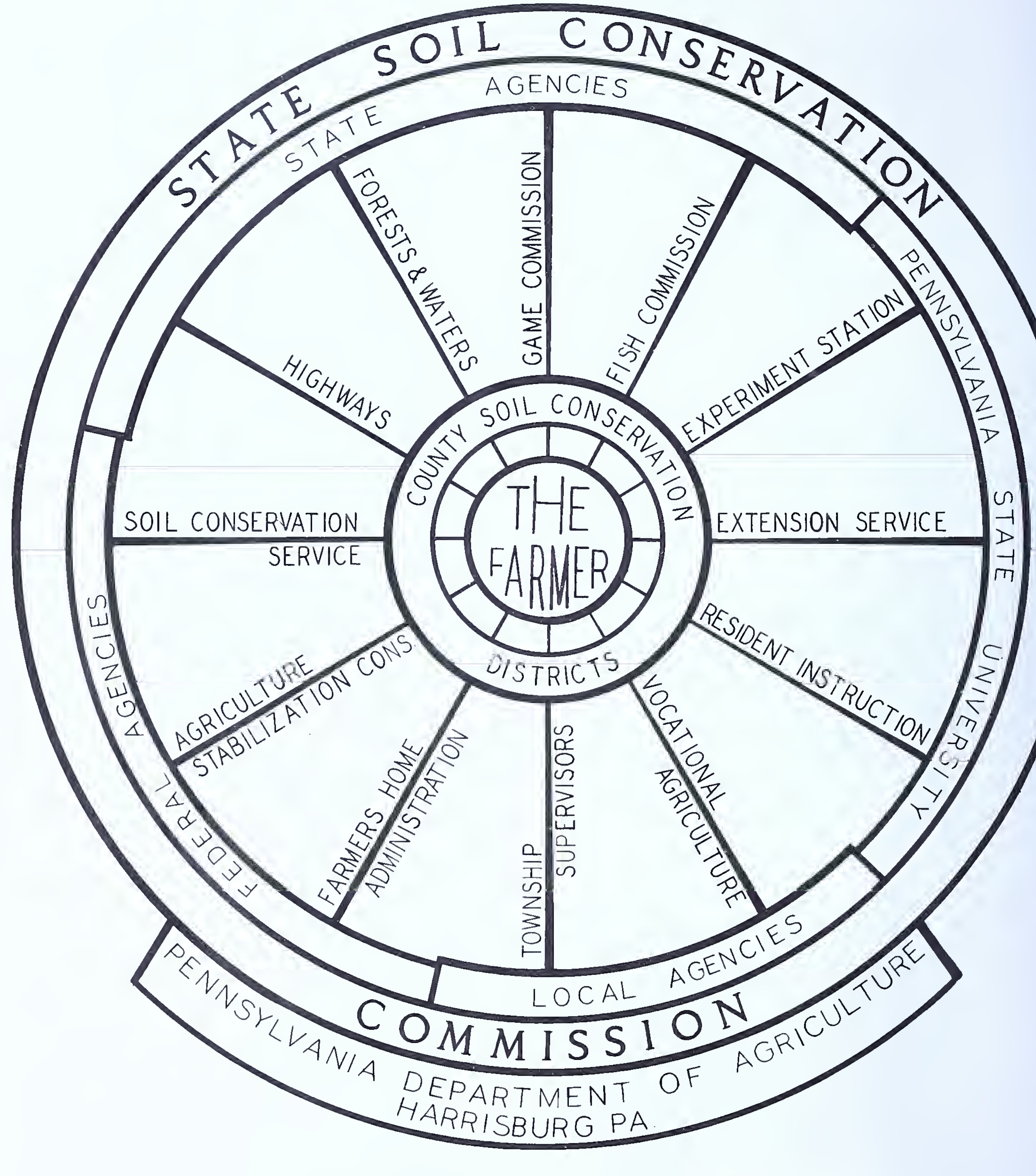
COUNTY SOIL CONSERVATION DISTRICTS



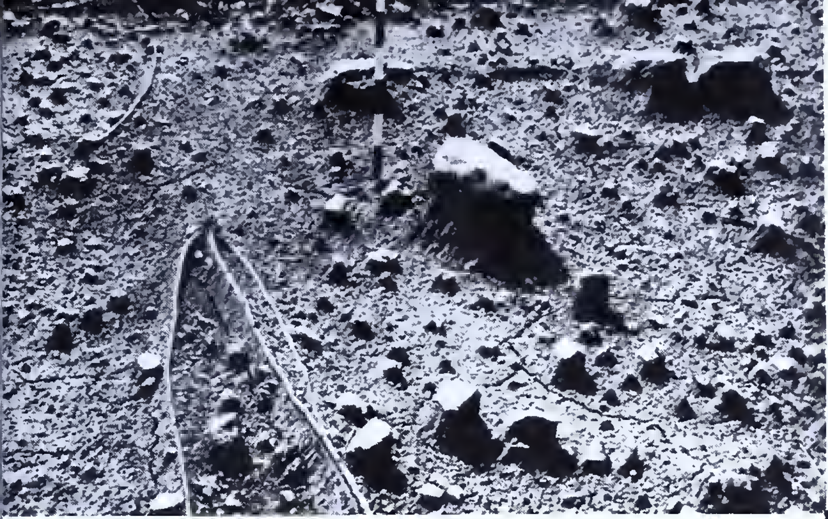
NUMBERS REFER TO THE ORDER IN WHICH THE COUNTIES BECAME SOIL CONSERVATION DISTRICTS IN ACCORDANCE WITH ACT 217. (1945)

DATES INDICATE THE DATE ON WHICH COUNTY COMMISSIONERS DECLARED THEIR COUNTY A SOIL CONSERVATION DISTRICT.

TWO TOWNSHIPS IN FRANKLIN COUNTY OPERATE AS A DISTRICT UNDER A PREVIOUS ACT.



Services Available to Farmers through Soil Conservation Districts



Erosion starts when raindrops pound the land and loosen the soil.

Soil Erodes

RAIN beating on exposed soil loosens the surface and splashing raindrops carry some of the soil with them.

If the surface is sloping, the soil moves down the slope with the water. This is the beginning of sheet erosion. Little islands of uneroded soil remain where they were protected by small stones, cornstalks or other cover.

As the water moves down a slope, it soon concentrates in little channels which are often drill or cultivator marks. Moving through these channels, the water picks up more soil and the channels become small rills.

Sheet erosion. Tiny rills in drillmarks. Note deposition where slope flattens out.

Rills cutting across this field have removed many tons of productive topsoil. Plowing and cultivation will smooth the surface but will not restore the soil.

The next cultivation will fill these, but the soil is a little bit thinner over the whole field. That is sheet erosion in action.

If the rills are not closed, the next heavy rain cuts them deeper and they become gullies too deep to cross with cultivation equipment.

If the gullies are plowed shut, they still leave low places in the field, where water collects. This may renew the gully if it is not given special protection.

Part of the soil washed out of the gullies is deposited on lower slopes.

The rest, containing much of the fertilizer and organic matter, goes on down the streams.

If neglected, gullies on deep soils get too deep to be closed by ordinary farm equipment. The land around them may be left idle because it is hard to farm it.

On shallow soils, gullies do not go very deep until they are on bedrock. Continued wearing away of land between the gullies results in exposure of large areas of subsoil or of partly weathered bedrock.

Erosion damage is not confined to upland areas. It also occurs along streams.

Shallow gully in wheatfield with deposition of soil and shale covering crop on lower slope.

Deep gully. Land around it is idle, even though it is deep, fertile soil on a moderate slope.

Man has destroyed nature's protective covering by cutting down forests and plowing up the land, exposing it to the full forces of water and wind. After every rain, the water rushes off the sloping land, carrying with it topsoil and plant food.

The longer this continues, the worse it becomes and often serious damage results.

Sheet erosion is the more or less even removal of soil in thin layers over an entire area of land. Although it is the least conspicuous form of erosion and most likely to occur without being detected, sheet erosion takes the best part of the topsoil—that is, plant food and the finest soil particles.

The soil survey made of a farm includes how much erosion has occurred, as well as other facts about the land.

Severe sheet and gully erosion of a steep, overgrazed pasture. Also exposed subsoil on moderately sloping cropland at right center.

Eroded soil and sometimes gravel and stones are piled out on the floodplains covering crops or pasture and choking the stream channels so that overflows are increased. Stream banks through pastures and near bridges erode if not given special protection.

Eventually, soil washed from fields reaches the streams. Some of it stops on the highways, where it makes a messy and expensive job for highway maintenance crews.

The erosion of this stream bank was caused by flood waters and cattle breaking down the sides.

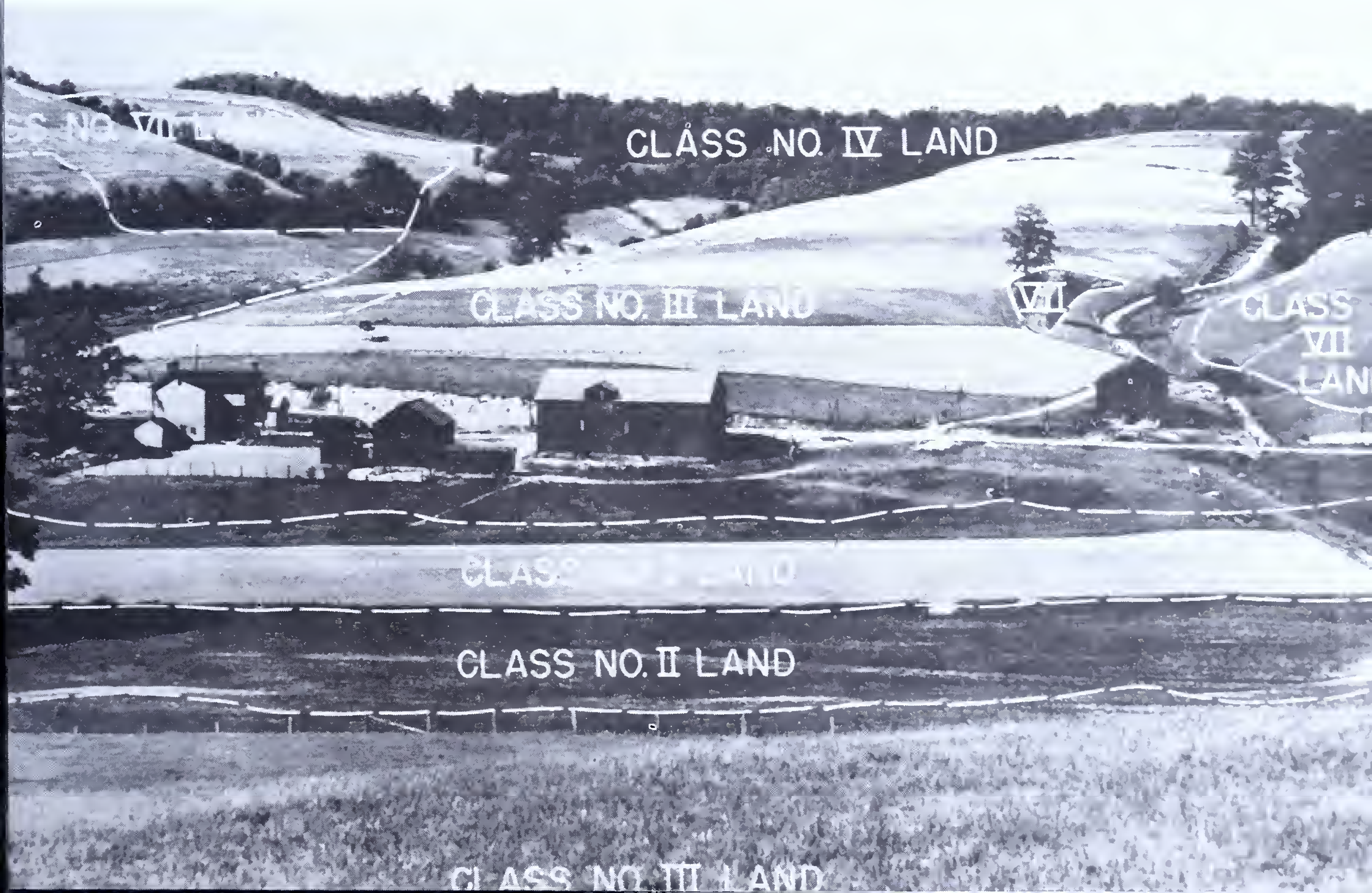
Before the land was put to the plow, nature protected it by covering the surface with vegetation such as grasses and trees so that when the rain falls it is held back and is allowed to soak into the soil.

Vegetation also cushions and breaks the impact of raindrops.

Soil from the watershed above this pond has completely silted it full in past 30 years.

Removing soil from a road. Heavy rain washed it from a large, clean cultivated field on a moderate slope.

This farm has five land capability classes, as outlined and labeled.



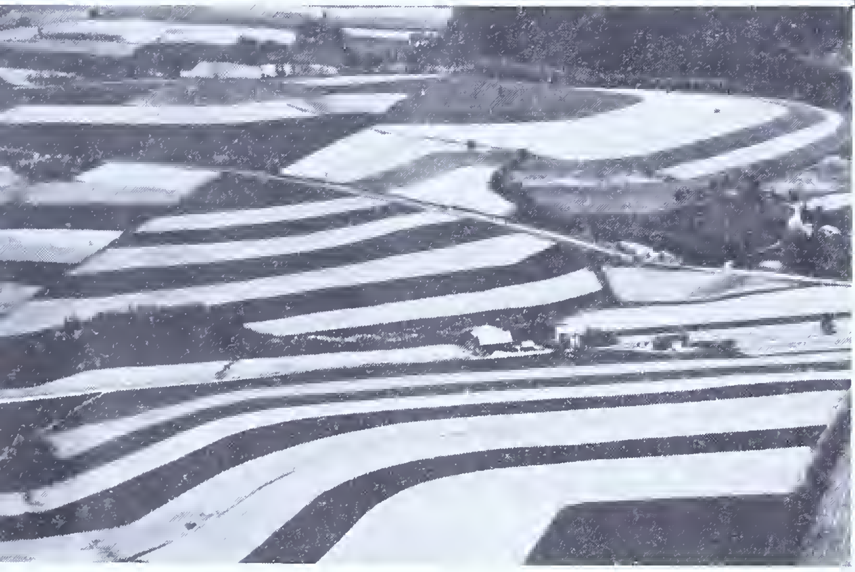
Level Class I land used intensively for truck crops grown with supplemental irrigation.

Land Capability Classes

CLASS I land is suitable for cultivation with no special conservation problems. It is nearly level, with deep well drained soils which need only ordinary good farming practices to maintain soil structure and organic matter.

Class II land is suitable for fairly intensive cultivation but needs some simple conservation treatment or has some natural limitation on its use.

Class II land which slopes enough to be subject to erosion if not protected by strip cropping and other simple conservation practices.



Class III land with moderate slope subject to erosion if not protected by strip cropping, diversions and sod waterways.

One example is gently sloping land that needs strip cropping and simple water management practices. Another is land with fairly good drainage, but not good enough for best yields of crops which require good drainage.

Proper selection of crops, following good rotations and maintaining soil organic matter help in the conservation farming of this land.

This land is Class III because of poor drainage. The soil in the foreground is poorly drained and has been improved for cropland by surface drainage.

Class III land is suitable for cultivation but needs intensive conservation practices. For example, moderately sloping land that needs strip cropping supplemented by diversions and a fairly long rotation, or wet land which needs drainage if it is to be used for cropland.

It also includes shallow soils where crop production frequently is limited by the low moisture capacity.

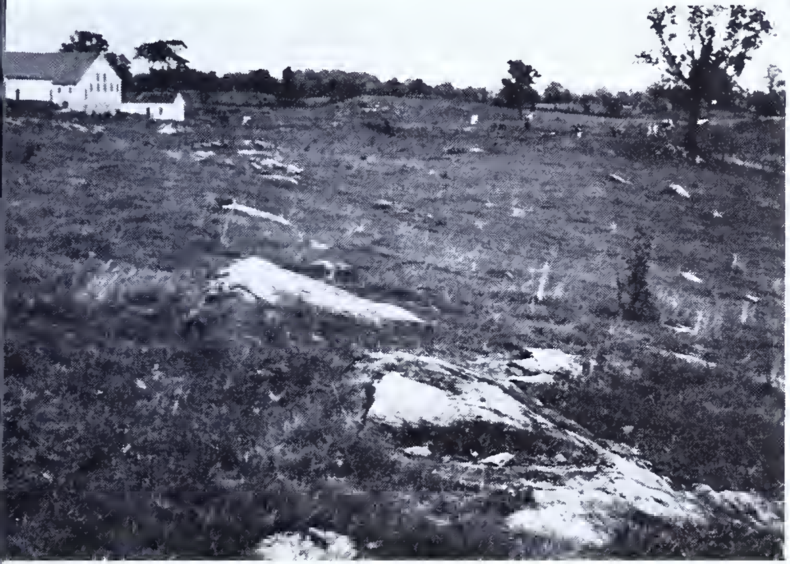
Class IV land is suitable for hay or pasture but not for frequent cultivation. If protected and improved by good sod crops, it can be cultivated occasionally without too much risk. An example is steep eroded land that needs thorough protection from erosion. Other land in this class includes wet land which can be drained enough for some hay crops, but not enough for cultivation in most years. It may also have enough stones or ledges to make plowing difficult.

Class IV Land—Alfalfa Field.

Class V land is suitable for pasture, woodland or wildlife uses without any special attention to conservation, but cannot be cultivated. Not much Pennsylvania land fits this description which limits it to very stony flat land, very wet land which cannot be drained, and areas with such unfavorable climate that crops cannot be grown. Very little occurs in Pennsylvania.

Class VI land is suitable for pasture, woodland or wildlife range but needs some simple conservation practices on pastures. This includes land which is too steep for cultivation, also stony land on moderate slopes where it is impossible to grow good pasture between the stones. Other examples are very wet soils that can be drained only partially and floodplain soils that are frequently overflowed.

Steep erodible land in the foreground does best when used for pasture. Such land is Class VI.



Because limestone ledges come close to the surface and outcroppings in many places make plowing difficult, this gently sloping land is Class VI.

Class VII land is suitable for woodland or wildlife uses, but usually not suitable for easy or safe use as pasture. It also includes steep land, very badly eroded land and stony land.

Class VIII is land that is suitable in some cases for wildlife production, or recreational uses. It is not suitable for cropland, pasture or commercial woodland production. Some examples are rocky upper slopes of mountains, coal mining wastes which do not support vegetation, large quarries, and the gravel bars along rivers and creeks.

Many things can be done to control erosion. Most of these practices also conserve water for use by plants.

Land Capability Classes are used by Farmers and soil conservationists to determine best land use and treatment. Every farm conservation plan is based on a land capability inventory. The use of land within the limits of its capability is an essential part of sound soil and water conservation.

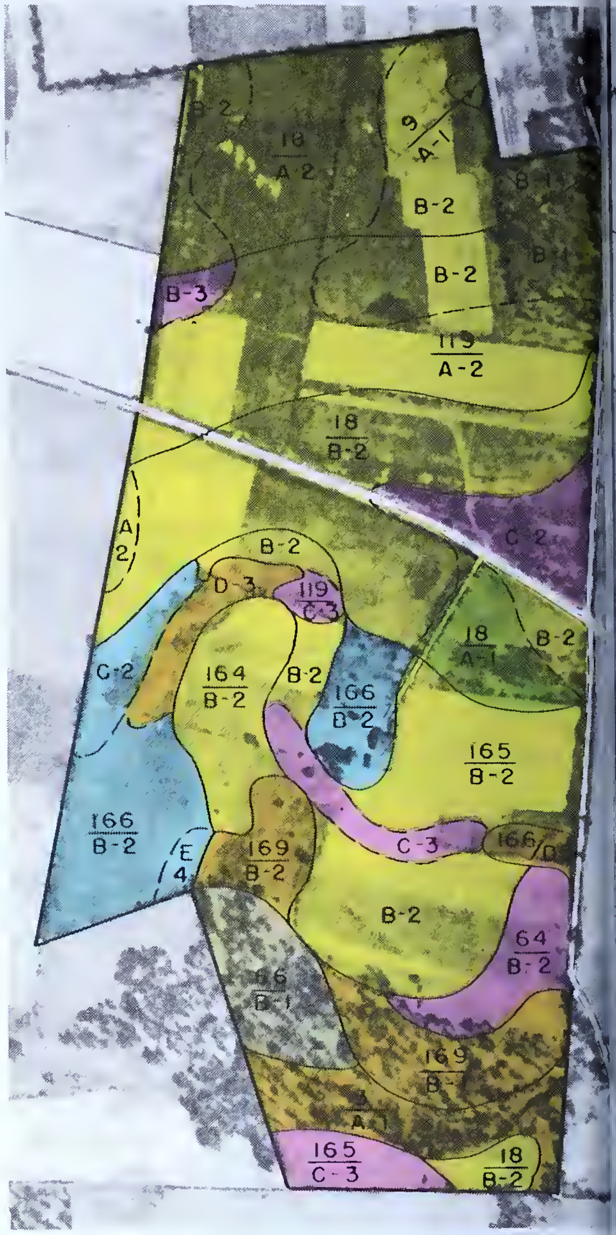
Poorly drained level land with tight subsoil that is very difficult to drain. Best uses are pasture or woodland.

What The Land Capability Map Shows

THE colored land capability map of an individual farm is really three maps in one. The base map is a copy of an aerial photograph taken on a clear day from several thousand feet in the air. It shows roads, fields, buildings, trees and other landmarks. On this background soil, slope and erosion are shown by black boundaries and symbols that are explained in a survey legend that goes with the map. Also, simple symbols indicate the use of the land at the time it was surveyed. The whole map is colored to indicate land capability classes.

The detailed information about soil, slope and erosion is interpreted in eight classes to show which areas are capable of the most intensive use, which areas should have only occasional cultivation and those which need the protection of grassland or woodland. The capability class indicates the degree of conservation needed and the hazard of improper use. It does not show the suitability for a particular crop or the productivity. These details are related to the soil types shown in the background.

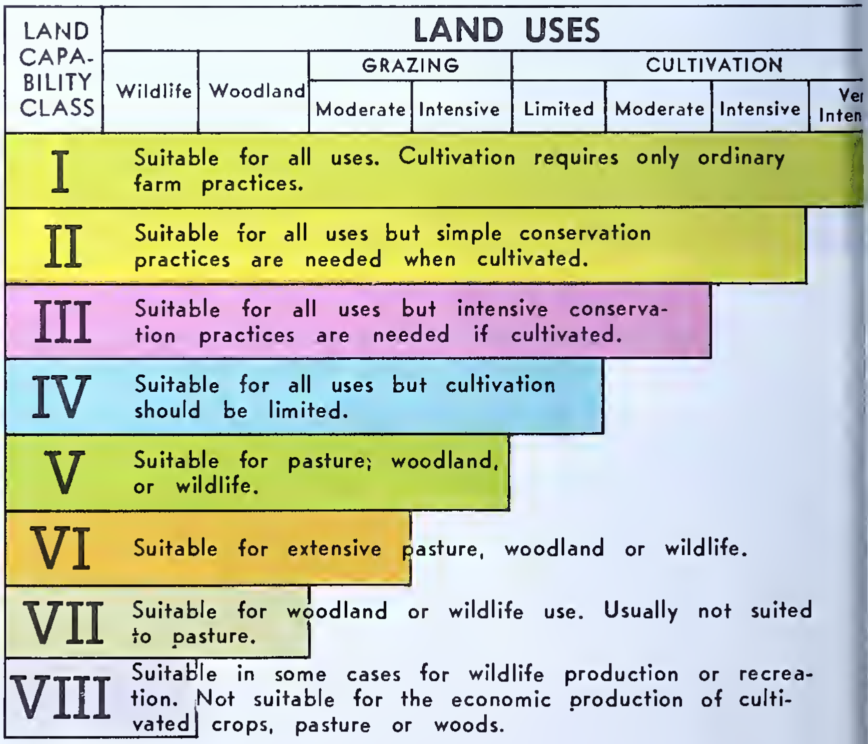
Taken together, these show what each piece of land is like, what it can do, and what it needs for safe permanent production.



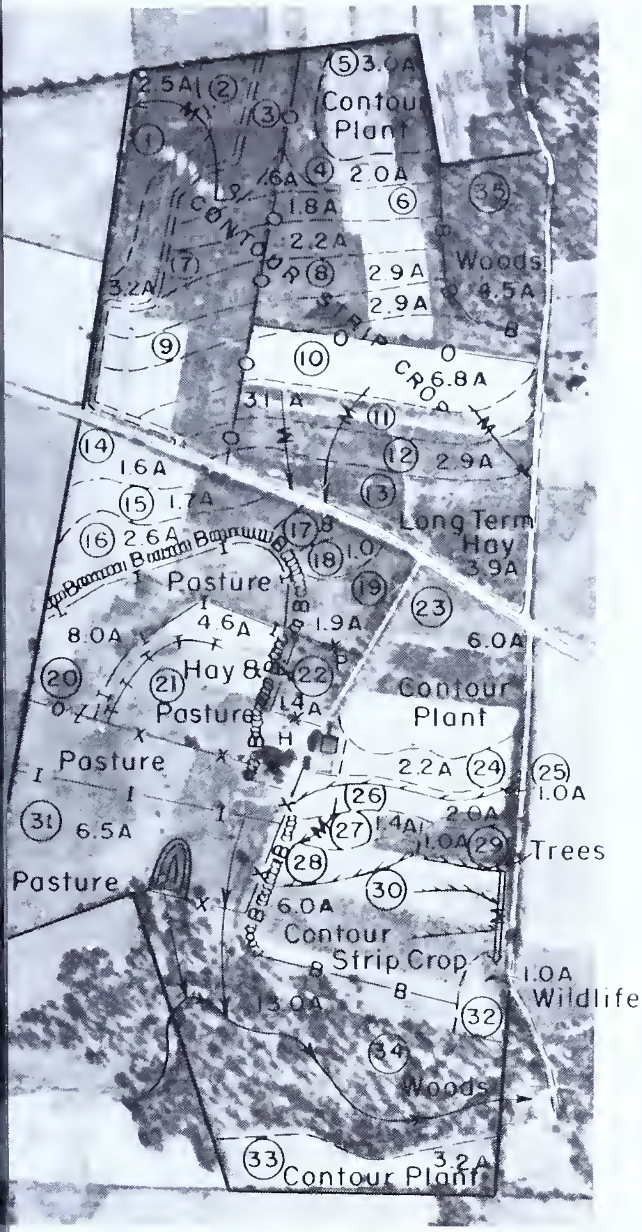
The soil survey of a 108-acre farm colored to show the land capability classes. →

Broad definitions of the capability classes are included in the legend with the map. Detailed explanation of symbols and descriptions of the soils are also shown. A conservation plan map shows the selected land uses and conservation practices which fit the land.

RELATIONSHIP OF LAND CAPABILITY CLASSES TO SAFE LAND USE



LAND CAPA-BILITY CLASS	LAND USES							
	Wildlife	Woodland	GRAZING		CULTIVATION			
			Moderate	Intensive	Limited	Moderate	Intensive	Ver Inten
I	Suitable for all uses. Cultivation requires only ordinary farm practices.							
II	Suitable for all uses but simple conservation practices are needed when cultivated.							
III	Suitable for all uses but intensive conservation practices are needed if cultivated.							
IV	Suitable for all uses but cultivation should be limited.							
V	Suitable for pasture; woodland, or wildlife.							
VI	Suitable for extensive pasture, woodland or wildlife.							
VII	Suitable for woodland or wildlife use. Usually not suited to pasture.							
VIII	Suitable in some cases for wildlife production or recreation. Not suitable for the economic production of cultivated crops, pasture or woods.							

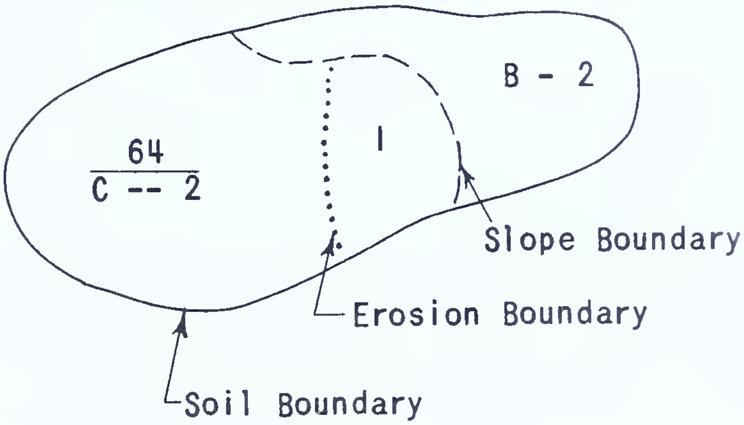


This map shows land use and conservation practices fitted to the land conditions shown on the capability map, and to the production needs of a dairy farm.

Legend

═══	Improved road
= = =	Unimproved road
-x-x-	Existing fence
-I-I	New fence to be built
-o-o	Old fence to be removed
——	Farm boundary
— —	Field boundary
B B	Hedge or Wildlife border
— -	Diversion border

Legend for Conservation Survey Map



SLOPE

A	Level or nearly level	D	Strongly sloping
B	Gently sloping	E	Steep
C	Moderately sloping	F	Very steep

EROSION

+	Accumulations	3	Severe erosion
1	Slight erosion	4	Very severe erosion
2	Moderate erosion	7	Occasional shallow gullies

LAND USE

L	Cultivated land	F	Woodland	H	Homestead
P	Pasture land	X	Idle land		

Soils On Your Farm

3 Wehodhee silt loam—Deep, poorly drained flood-plain.

9 Glenville silt loam—Deep, moderately well drained or lower slopes.

18 Chester silt loam—Deep, well drained upland.

64 Aldino silt loam—Shallow to moderately deep, somewhat poorly drained, with low natural fertility.

66 Aldino stony silt loam—Shallow to moderately deep, somewhat poorly drained, too stony to cultivate.

119 Glenely channery silt loam—Moderately deep well drained.

164 Conowingo silt loam—Deep, moderately well to somewhat poorly drained with low natural fertility.

165 Neshaming gravelly silt loam—Deep, well drained, with moderate natural fertility.

166 Neshaming stony silt loam—Deep, well drained stony with moderate natural fertility.

169 Calvert silt loam—Deep, poorly drained, with low natural fertility.

This floodplain is in its best use when in pasture. Frequent flooding puts it in Class VI.

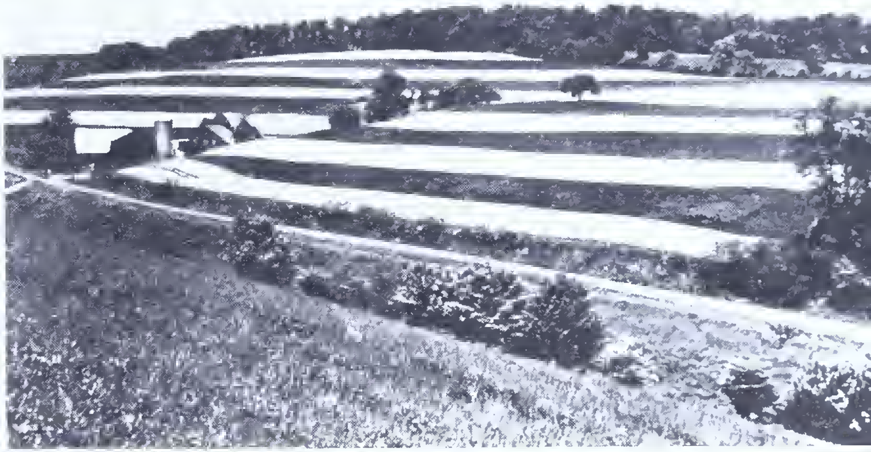
This steep eroded hillside has been started on the road to productive farming. This picture was taken 12 years after picture on page 8. Class VII.

Rock slides on mountains, ledges and cliffs fall into Class VIII land.

Muskrats are making the best use of this marsh. It is Class VIII land.

On gentle slopes with deep soils bending the rows to follow the contour—run on the level—water is held where it falls and erosion is stopped.

Alternate strips of cultivated and close-growing crops planted on the contour break up long slopes.



A rotation of corn, oats, wheat and hay for two years makes contour strip cropping effective on this farm.

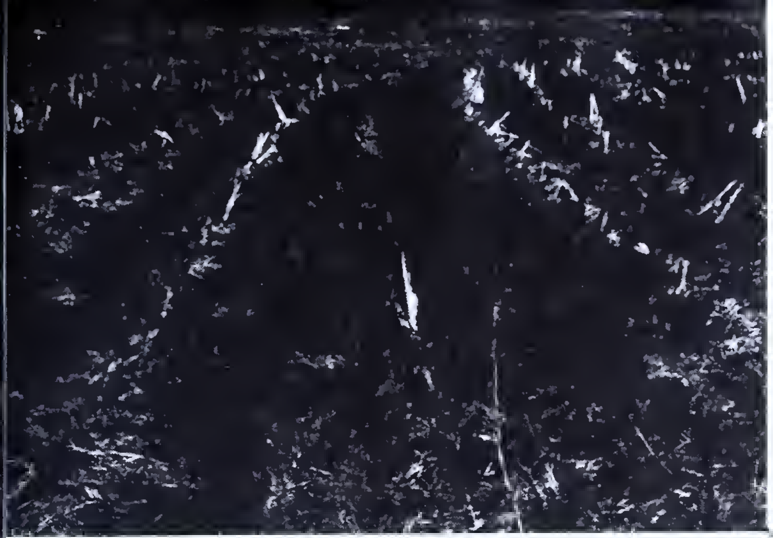
On long slopes, diversions intercept storm runoff and carry it off the field on a gentle grade.

➤ A good diversion blends into the slope and hay crops can be grown and harvested on it.

Carefully graded and permanently sodded channels are useful where storm runoff must be carried down a slope. ➤

➤ Where gullies have started in a field, sod waterways left when strips are plowed prevent the cutting of new channels.

Cropland terraces control runoff and reduce erosion on cultivated land. ➤



A cover crop seeded at the last working of corn or vegetables prevents erosion, adds organic matter to the soil and reduces leaching of plant nutrients.

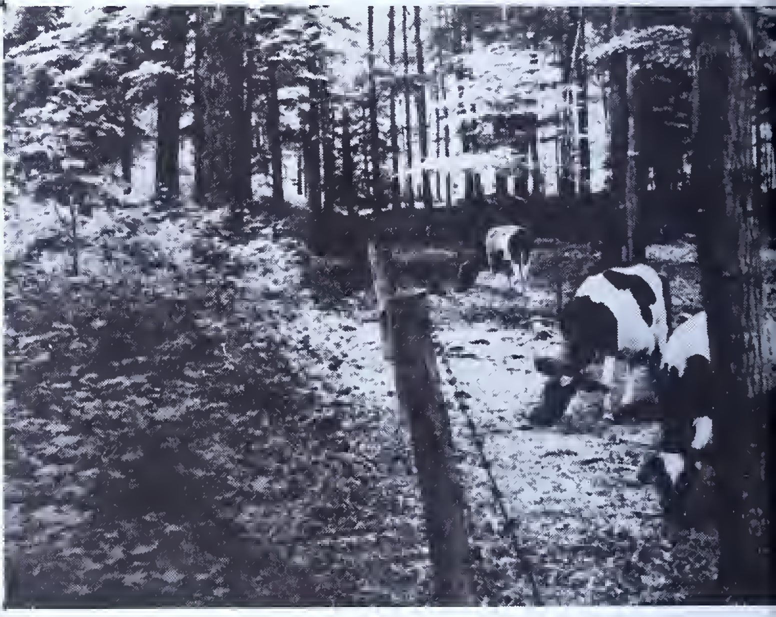
This young orchard was planted on the contour. It is seeded annually with a cover crop. When it is necessary to cultivate, the land is disked, but enough of the cover crop is left on the surface to make a strawy mulch.

Improved, well managed pastures protect the soil from erosion. This one also feeds two cows per acre during the grazing season.

In establishing new pastures on steep eroded cropland, contour furrows help hold water and soil until grass gets established. New pasture at lower left and center of photo is furrowed.

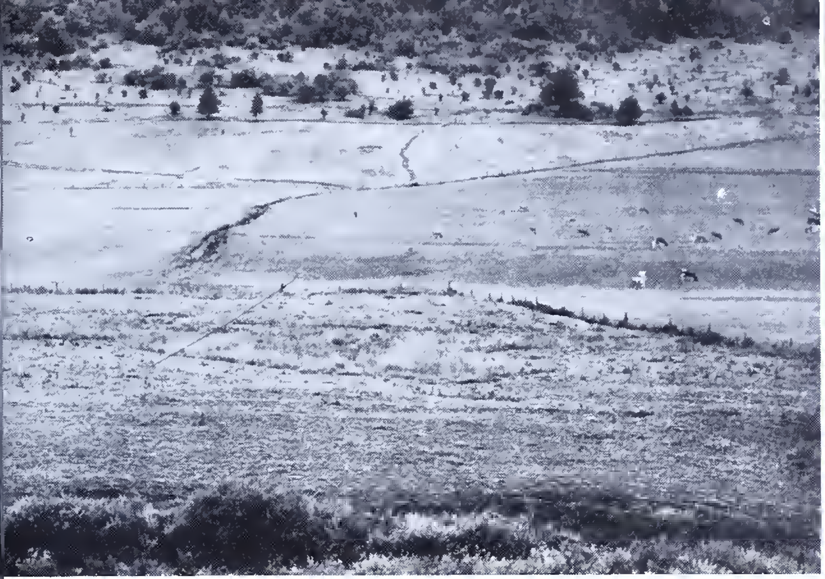
◄ Tree planting on idle land that should be in forest. Vocational Agriculture students learn about reforestation.

Woodland protected from fire and grazing has good ground cover and a new timber crop coming on. Grazed woodlot on right has no young trees and very little grass. The soil is compact and hard. Water runs off and will eventually take much of the soil with it. ►

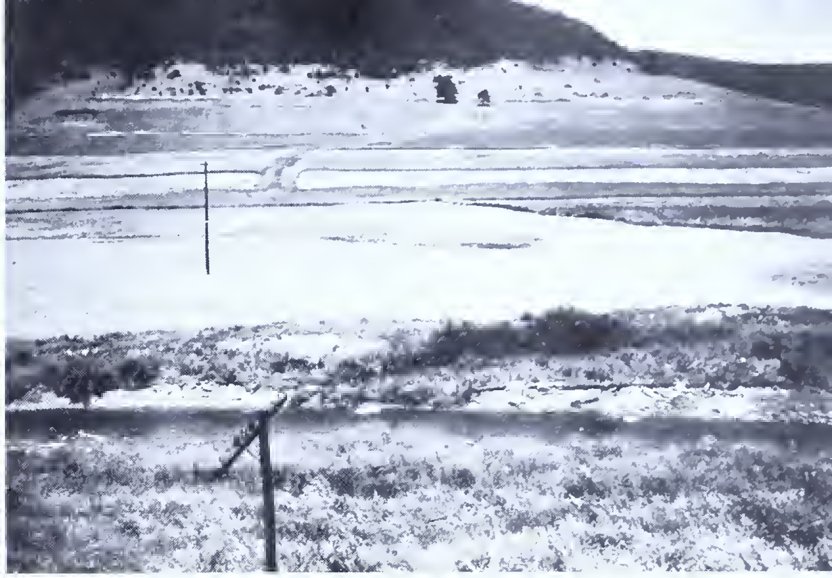


◄ This streambank is protected by vines and grasses. A fence protects it from trampling by cattle.

Grass and shrubs protect these roadbanks. ►



Before



After

The picture on the left shows gullies cutting into a poorly drained soil. In the picture on the right, two diversions intercept runoff and water seeping from wet weather springs. With the drainage improved and the gullies healed, the lower slope now is productive cropland which can be cultivated in strips parallel to the diversions.

Additional Benefits of Soil Conservation

IN ADDITION to the prevention of erosion, there are other soil conservation jobs. A complete soil conservation plan provides for remedying other unfavorable land conditions to make farm operation more efficient and productive. Sometimes practices which are effective for erosion control also help with some other problem, such as drainage.

All growing things depend on water. It is the very livelihood of civilization. Where there are ample supplies of good water, farms thrive and cities prosper. Where the supply of water fails, farms are abandoned and communities quit growing.

Water does not stop at man-made boundaries. The only boundaries that it will heed are those set by nature through the centuries. The water flows in the same places year after year. So, water from one farm may benefit or injure other farms in the watershed. The small watershed group provides the medium through which farmers who recognize their mutual problems in dealing with water can work together in solving those problems. Their success in dealing with these water problems will not only benefit them, but will have favorable effects on many communities downstream.

Forest conservation practices add to the income of many farmers. When practiced on the large forests of Penn's Woods, they add to the general welfare of the State in products used by industry, and in recreation for the people.

Conservation farming on a complete watershed basis benefits water supply systems and downstream uses in many ways. It reduces the amount of silt that clogs channels and dams—silt that has to be filtered out of water supplies. By increasing the infiltration of rainfall into the soil, conservation farming renews ground water supplies and makes more water available through springs and wells.

This drainage terrace, cut deep enough to reach the hardpan, improves the drainage of the slope below it.

Tile drainage makes poorly drained soils with open subsoils usable for more and better crops.

A well drained, properly located farm pond provides water for livestock, irrigation and fire protection. It also provides wholesome recreation.

This ungrazed farm woodlot with mature trees removed shows growing trees of all ages.

Conservation Farming Is Efficient Farming

CONSERVATION of soil and water means efficient and sustained use not merely saving for the sake of saving.

Many erosion control practices involve contour farming operations. It is easier, more economical to operate farm equipment on the level following the contour than up and down over the hills. Less tractor fuel is required and less gear shifting. Rows in contour strips are longer than in square fields of the same area. When a good conservation program is in effect on a farm, there is little chance for gullies to develop and wear and tear on field machinery is reduced.

Lack of water in the growing season often limits crop yields. Much of the midsummer rainfall comes as heavy, intense storms which last only a short time. Without conservation farming much of this dashing rain runs off, causing erosion. The dry soil is moistened only to a shallow depth. Contour farming operations make each row and each cultivator mark a little dam to hold back some of this water until it can soak in. This is water when and where it is needed.

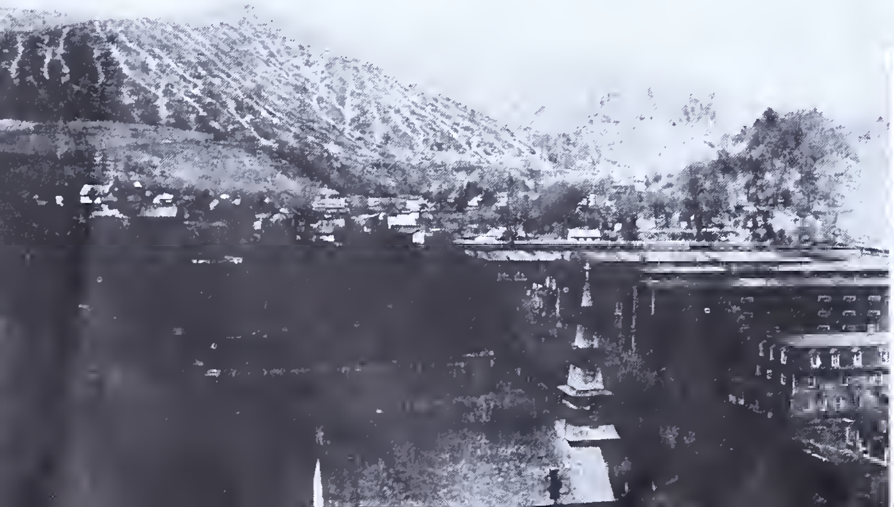
Some soils are too wet at certain seasons. Well planned and carefully installed drainage permits use of these wet soils by a wider range of crops and allows farming operations to be carried out at the right time. Drainage is especially useful where small areas of poorly drained soil interfere with efficient use and conservation of large areas of better drained soils.

Controlling erosion and keeping the soil in place has many direct economic advantages. Erosion removes plant nutrients, including those added in fertilizer. Soil organic matter is concentrated near the surface. Also, it is lighter than mineral soil and when erosion starts a high proportion of organic matter is lost. Surface soil usually has better structure and tilth than subsoil. When it is lost, and clods or blocks of subsoil are plowed up, it is more difficult to prepare a good seedbed.

With conservation practices, and with the land

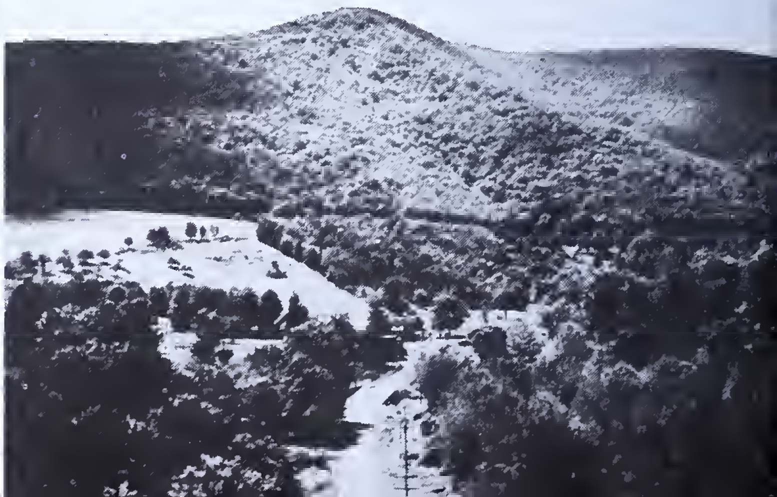
Timber resources made this town prosperous during the lumber boom. Clear cutting left the hills denuded and eroding. Now under protection, the hills are again covered with trees. (Photo by Pennsylvania Department of Forests and Waters)

Before



The town has shrunk with the disappearance of the lumber mill and tannery. Eventually, the renewed forest will support new industry. (Photo by A. P. Akeley)

After



properly used, yields are best and quality of crops grown is good. High yields of good crops help provide for well fed livestock and increase the farm income.

A neighborhood of good farms managed for long-time sustained production contributes to better living for everyone in the community. With sufficient farm income schools, churches and farm organizations are well supported. Also, shopping centers are larger and better stocked and good medical and dental services are more likely to be available than where agriculture is less stable.

•

Protected woodlands on mountain slopes are drained by clear streams that invite the fisherman and provide abundant clean water for towns and industries.

Cutting some trees along the edge of woodland reduces shading of crops and provides food and shelter for wildlife as shrubs and brush grow up.

Another way to provide a woodland border is by planting shrubs along the edge of the field.

Acknowledgments

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Also, to the Soil Conservation Service of the United States Department of Agriculture, to the Pennsylvania Department of Highways, to the Pennsylvania Department of Forests and Waters, to the Pennsylvania Game Commission, to the Pennsylvania Fish Commission and to The Pennsylvania State University appreciation is expressed for their helpful counsel in reviewing the text and illustrations.

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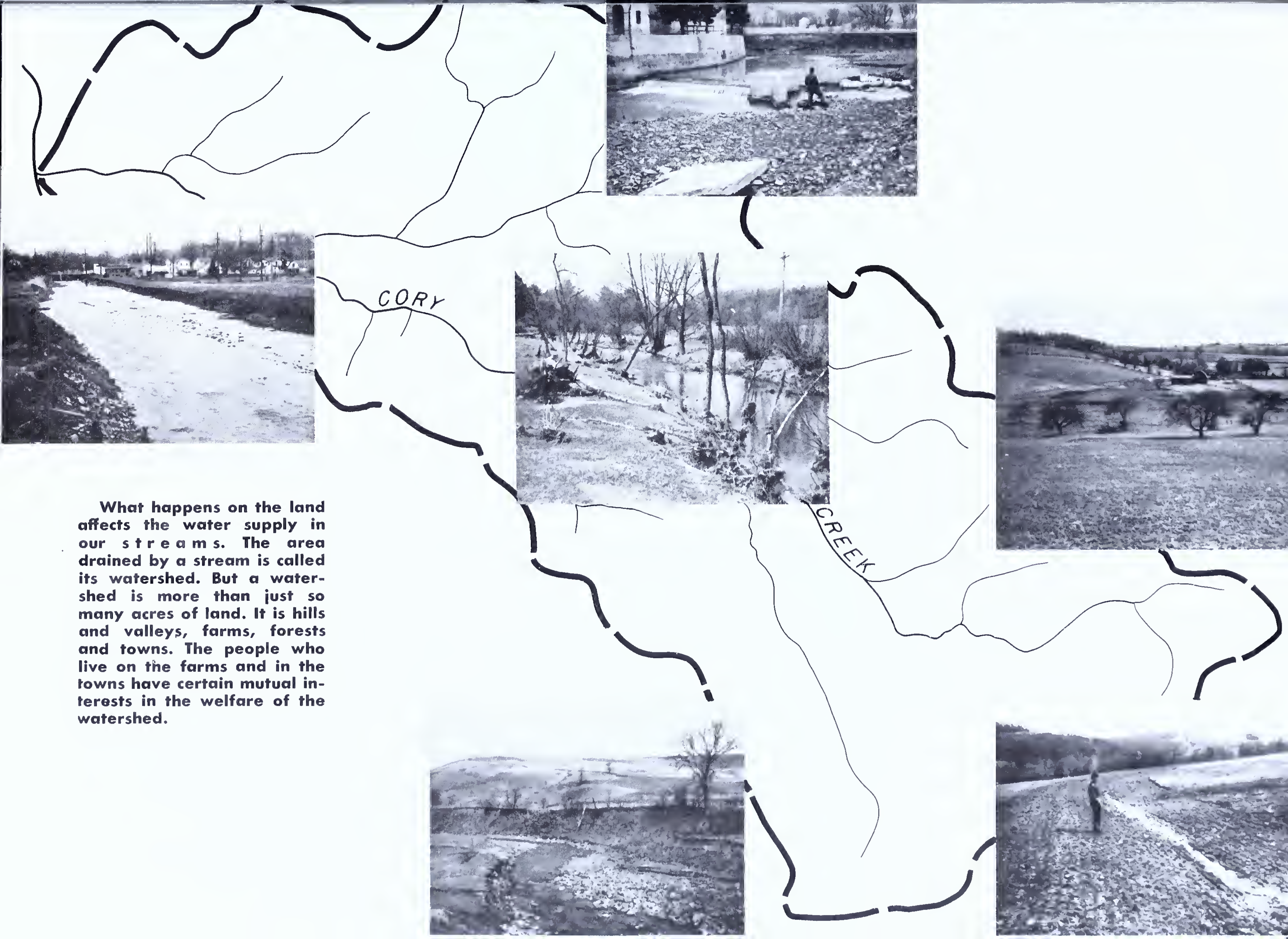
Oscar A. Kimmel

State Supervisor
Soil Conservation Districts

All pictures except those otherwise indicated are supplied by the Soil Conservation Service.

1201



What happens on the land affects the water supply in our streams. The area drained by a stream is called its watershed. But a watershed is more than just so many acres of land. It is hills and valleys, farms, forests and towns. The people who live on the farms and in the towns have certain mutual interests in the welfare of the watershed.

Looking Ahead Together

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